U.S. Fish & Wildlife Service

Abernathy Fish Technology Center Newsletter

Volume 8, Number 6, November/December 2016

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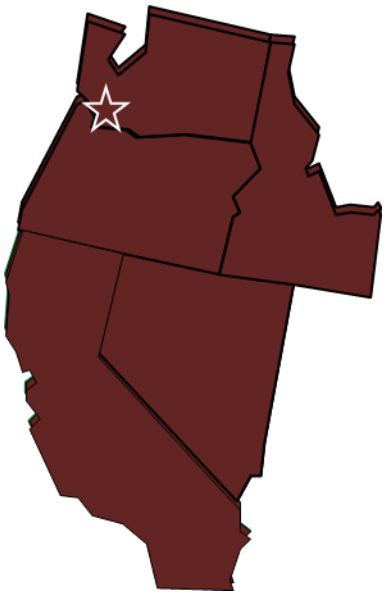


Serving the Pacific and Pacific Southwest Regions

More Change at Abernathy FTC

Kyle Hanson. Photo Credit: FWS

Vince Bocci. Photo Credit FWS

Intelligence is the ability to adapt to change—Stephen Hawking

A lot of change occurred in November and December as people left Abernathy FTC for opportunities elsewhere or were hired to fill vacancies at Abernathy FTC. FWS offices were able to lure away a few of our outstanding employees. Regional Physiologist Kyle Hanson is now the Deputy Project Leader at the Columbia River FWCO, and Administrative Officer Vince Bocci transferred to the Pacific Region Fish Health Program. Abernathy FTC's Steve Dyer will fill Vince Bocci's position as Administrative Officer. Other employees competed to fill vacancies at Abernathy FTC. Patty Crandell will be the new Director, Geneticist Justin Bohling is the new Deputy Regional Geneticist, Brice Adams has a new position in the Conservation Genetics Program, and Will Simpson is the new Deputy for the Quantitative Ecology & Technology Program. We were fortunate to be able to hire staff from outside Abernathy FTC who will fill other vacancies including: Steve Money from Hagerman NFH (Facility Operations Specialist), Matthew Piteo from US Geological Survey (Biological Technician, Genetics), and Alina Nestjorkina recently from the Peace Corps (Administrative Assistant). Positions previously held by Hanson, Crandell, and Adams will remain vacant for the foreseeable future.

Program Highlights

Administration/Facilities

Mark Hack and Patty Crandell finalized Abernathy FTC's Technology Spend plan.

Kyle Hanson represented Abernathy FTC at a one-day hiring event for veterans in Vancouver, WA, seeking applicants for a GS-5 Administrative Assistant and a GS-11 Facilities Operation Specialist.

Walker River Construction began work on the project to update Abernathy FTC's well #4. Jeff Poole has been assisting the two contractors on the well pump and backflow valve replacement projects while upgrading Abernathy FTC's domestic water system.

The Cowlitz Indian Tribe and the Technical Advisory Committee of the Lower Columbia Fish Recovery board conducted a site visit to show off the side-channel habitat restoration project.

The ancient brown hatchery truck slipped off the pavement and down an embankment while it was parked, signaling it was well past retirement. The keys are now controlled by the Abernathy FTC's Collateral Duty Safety Officer (CDSO) until a decision is made about the truck's final resting place.

Conservation Genetics

Abernathy FTC genetics staff participated in a webex meeting with scientists from NOAA Fisheries and the

The hatchery truck awaiting its final resting place. Photo Credit: Alina Nestjorkina

Staff

Administration & Facilities

Center Director, Vacant
Patty Crandell, Acting Center Director
Vince Bocci, Administrative Officer
Steve Dyer, Administrative Assistant
Mark Hack, IT Specialist
Jeff Poole, Water Treatment Plant Operator
Jim Lowell, Maintenance Worker

Conservation Genetics

Christian Smith, Regional Geneticist
Conservation Geneticist, Vacant
Matt Smith, Conservation Geneticist
Justin Bohling, Conservation Geneticist
Jennifer Von Bargen, Lab Geneticist
Brice Adams, Conservation Geneticist
Biological Science Technician, Vacant
Ben M. Prom, Biological Science Technician

Physiology & Nutrition

Ann Gannam, Regional Nutritionist
Richard Glenn, Microbiologist
John Holmes, Fish Biologist
Ron Twibell, Fish Nutritionist
James Barron, Fish Biologist
Kelli Hawke, Biological Science Technician
Rachel Headley, SCA

Quantitative Ecology & Technology

Doug Peterson, Senior Scientist
Ben Kennedy, Fish Ecologist
Will Simpson, Fish Ecologist
Kurt Steinke, Electronics Engineer
Margot Cumming, SCA
Paul Kieras, SCA

Program Highlights— continued

University of Washington. The purpose of the meeting was to evaluate new research by NOAA Fisheries which could shape the way genetic samples from fish are handled in the future.

Justin Bohling and Christian Smith participated in a teleconference with NOAA Fisheries, Bureau of Reclamation (BOR), the University of California at Davis and the Winnemem Wintu to discuss reintroduction strategies for ESA-listed Chinook salmon above Shasta Dam on the Sacramento River.

Brice Adams analyzed genetic data from bull trout in Icicle Creek for Leavenworth NFH and the Mid-Columbia River FWCO.

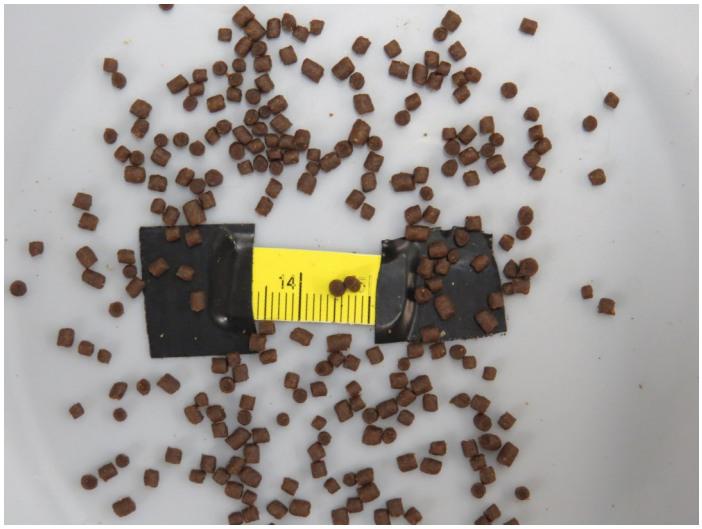
Jennifer Von Bargen and Justin Bohling worked on implementation of GTSeq at Abernathy FTC. GTseq is a new analysis protocol developed by our partners at Columbia River Inter-Tribal Fish Commission (CRITFC), which has vastly improved the efficiency and speed with which large-scale genetic analyses (those involving thousands of individuals) can be conducted. DNA libraries for redband and steelhead trout were built at Abernathy FTC and then sent to the Midwest Fisheries Center to be loaded on the high-throughput sequencing instruments. The data from this initial run will be used for a collaborative project between Oregon Department of Fish and Wildlife (ODFW) and FWS to evaluate population structure in redband trout in the upper Deschutes Basin.

A beautiful December afternoon on Abernathy Creek. Photo credit: Christian Smith

Jennifer Von Bargen posted next-generation DNA library preparation methods used at Abernathy FTC to the FWS Genetics Commission of Proctor shared drive. The protocols will be used by FWS labs in other regions to generate comparable data.

Brice Adams completed the genetics portion of our annual report to Bonneville Power Administration (BPA) on reproductive success of steelhead in Abernathy Creek.

Christian Smith and Matt Smith met with representatives from ODFW and BPA to discuss a collaborative project studying how the presence of hatchery fish impacts reproductive success of natural-origin steelhead in the Deschutes River basin.



Inconsistent feed sizing. Photo Credit: Ann Gannam

Physiology & Nutrition

In the last two months of the 1st quarter, November and December, we received 12 feed samples from the NFHs in the Pacific and Pacific Southwest Regions. As part of the routine analyses, feeds from the hatcheries were checked for rancidity. Ann Gannam wrote the feed memos which are sent to the hatcheries and the feed mills. Possible fish feed issues have surfaced at NFH and a tribal hatchery. Results of feed analyses were interpreted for the Northwest Indian Fish Commission and Winthrop NFH. The results have also been discussed with the fish health personnel. Also, it came to light that several lots of 2.0 mm feed contained mixed sizes. This sizing issue just seemed to pertain to the 2.0 mm pellets.

James Barron, in maintaining lamprey ammocoete stock fish for the Chelan PUD project, has been inventorying the fish, monitoring growth and providing

Program Highlights— continued

feed and tank cleaning. The portion of this year's lamprey study and evaluation of water flow levels in the lamprey tanks, has been completed. Two more studies were started investigating the best number of tank cleanings per week and evaluating of three different grain sizes in the sediment used for rearing the fish. The Yakama Nation, NOAA Fisheries and the Confederate Tribes of the Umatilla Indian Reservation are partners on this project which was initiated to learn the best culture methods for raising lamprey to provide fish for the Chelan PUD. In addition Student Conservation Association (SCA) intern, Racheal Headley completed the analyses of lamprey for body composition from the Fisheries Operational Needs (FONS) project, "Rearing larval Pacific lamprey in poly-culture using the effluent from tribal hatcheries".

James Barron cleaning out lamprey tank. Photo Credit: Anna Grannam.

Ron Twibell, in response to information received from Pacific Region NFHS concerns about coho run sizes and poor adult condition as well as egg survival proposed a sampling scheme, to collect coho eggs for proximate composition and nutritional analyses from Quilcene and Eagle Creek NFHs. Kari Dammerman from the Columbia River FWCO has been working with Ron. Racheal also helped collect samples and is analyzing eggs. The objectives for this proposed study are to obtain baseline information on coho salmon egg biochemical composition and determine whether such data can be used to predict hatching success and survival of progeny and determine whether coho egg biochemical composition may be used as an indicator of recent ocean productivity. Thus this project is connected to climate change and the impacts it may be having on sensitive species.

Racheal Headley is also helping Ron analyze the steelhead from the BPA project feeding trial which involves testing a lower lipid diet verses a standard diet. They are looking at proximate and fatty acid composition. Fish samples are collected every month for analysis.

Richard Glenn is on the Workplace Quality Team and is attending weekly Vidyo conference calls to discuss the review of the Federal Employee Workplace Survey that was done in 2016 and propose ideas to improve federal employee job satisfaction.

John Holmes worked with Columbia river FWCO tagging staff to get all the steelhead coded wire tagged and clipped. Their count for the fish was 7517 (we expect to release 7200 fish due to natural mortality and nutrition study sampling). Returning steelhead: 1 Natural Origin (NOR), 3 strays; cutthroat trout: 2 NOR; Chinook: 2 NOR, 6 Hatchery Origin (HOR); chum: 4 NOR; coho: 154 NOR, 128 HOR. The coho run was early because of the rain but over 300 fish came into the holding ponds.

Richard Glenn is finalizing a draft report concerning possible thermal impacts on eggs and milt of spring Chinook during the transfer from Little White Salmon NFH to Warm Springs NFH this past summer.

Abernathy FTC staff visited two Lower Snake River Compensation Plan (LSRCP) hatcheries to

Reports

Von Bargen, J. 2016. Genetic identification of endangered Winter-run Chinook salmon in the Sacramento River, CA. Abernathy FTC Final Report.

Bohling, J. H. 2016. Genetic profile for Quinault NFH chum salmon. Abernathy FTC Final Report.

Program Highlights - continued

get gill samples for ATPase to answer a question the LSRCP Office had about the fish from one hatchery having better returns than the other although both were using the same stock of steelhead. There will be another sampling in January then in early April or March. The two hatcheries are Lyons Ferry and Irrigon. There is concern that steelhead from the same stock raised at two different hatcheries have greatly different return rates.

Tim Whitesel of the Columbia River FWCO and Ann Gannam completed a survey of Pacific Region employees for the FAC Training and Employee Development Work Group to gain information about the needed employee training. The work group is chaired by Matthew Patterson at NCTC.

Antenna (black plastic) and waterproof housing (silver) on one of the antennas in the Umatilla River PIT tag array being tested in a raceway. (Photo Credit: Doug Peterson)

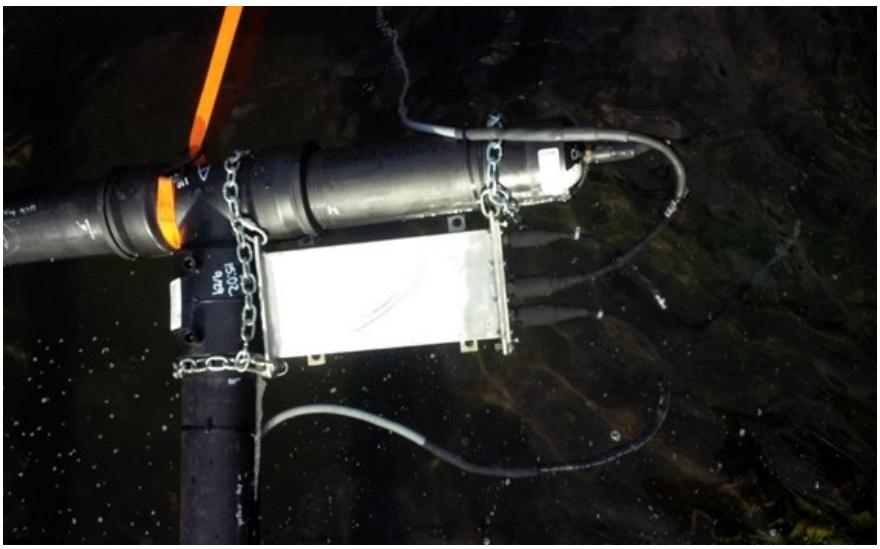
Quantitative Ecology & Technology (QET)

Kurt Steinke checked the system integration and water assistance of a large multi-antenna Passive Integrated Transponder (PIT) antenna array in one of the raceways at Abernathy FTC. The array will be installed in the Umatilla River system to measure movement and entertainment of Pacific Lamprey. SCA interns Margot Cumming and Paul Kieras assisted with the testing.

QET staff were very busy collating, organizing, analyzing, and reporting on data collected for the BPA-funded steelhead reproductive success project in Abernathy Creek. Ben Kennedy led the data analysis and report writing, and SCA interns Paul Kieras and Margot Cumming entered and complied electrofishing capture and stationary PIT antenna data, and produced summary graphs.

Will Simpson competed the annual report for the BOR-Umatilla River operations project, which summarized entertainment and bypass rates for ESA-listed steelhead at irrigation diversions in the lower Umatilla River.

Doug Peterson was an invited participant at the Lower Mekong River Fish Passage Conference in Vientiane, Laos. The objective of the conference was to highlight current applied research to inform policy and decision-making across the Lower Mekong Basin (LMB). Delegates included government agencies, developers, researchers, local provincial and district leaders, and natural resource managers: there were more than 150 participants form 14 countries. Doug gave a presentation on the ecological modeling of fish passage decisions during a fish passage monitoring workshop spon-



Close up of antenna (black plastic) and waterproof housing (silver) on one of the antennas in the Umatilla River PIT tag array being tested in a raceway. (Photo Credit: Doug Peterson)

Program Highlights— continued

sored by U. S. Agency for International Development. The DOI International Technical Assistance Program (ITAP) thought the Smart Infrastructure for the Mekong (SIM) program coordinated Doug's trip.

Doug Peterson peer reviewed a draft report by and international consultant who was modeled the potential population-level effects of different design considerations of the planned Sambor Dam, in Cambodia, on five species of migratory fish. The report will be used in the dam planning process to determine location and fish passage facilities.

US Government Delegates at the Lower Mekong River Fish Passage Conference. From left to right: Gary Jahn (USAID), Michael Roy (DOI-ITAP), David Hand (FWS Columbia River FWCO), Ann Kulthida Techasarin (DOI-ITAP), Doug Peterson (FWS Abernathy FTC), Stephen Walsh (USGS), John Beeman (USGS-Emeritus), and Daniel Deng (Pacific Northwest National Laboratory).

Doug Peterson, Will Simpson, Kurt Steinke, Paul Kieras, and Margot Cumming conducted a site visit to Little White Salmon NFH to meet with the Hatchery Manager, Bob Turik. Abernathy FTC is developing a PIT-tag detection system for a fish pumps used at Hagerman NFH, where Bob used to work, and Little White Salmon similar fish pump, was inspected to help generate design ideas for the system to be developed at Hagerman. Abernathy FTC is funded by LSRCP, to help Hagerman NFH evaluate PIT tag loss in steelhead reared in partial reuse aquaculture tanks vs. those reared in traditional serial reuse raceways so that in-river survival estimates are not biased by differential tag loss.

Fish Biologist Will Simpson completed a month-long detail into the Fish Passage Coordinator position in Fisheries and Aquatic Conservation in the FWS Regional Office during November.

Doug Peterson served as Acting Deputy Center Director during November and early December.

Margot Cumming and Paul Kieras, SCA interns, were trained to press and age salmon scales by Will Simpson. The scales were collected from steelhead as part of the steelhead reproductive success project in Abernathy Creek.

Group picture from the Lower Mekong River Fish Passage Conference in Vientiane, Laos, in November 2016.

Outreach

Avid fisherman Hal Manke, a longtime volunteer for Abernathy FTC, Washington Department of Fish and Wildlife (WDFW), Lower Columbia Fish Enhancement Group, and Lower Columbia FlyFishers among other organizations, brought two of his fellow volunteers with a passion for fish to Abernathy FTC for a tour. Hal, Brian Davern, and Rick Yahrmarkt were given a tour of the facilities and participated in a discussion about hatchery and wild salmonids with staff from the Conservation Genetics Program. Their visit was much appreciated by staff. Public agencies are fortunate to have such well informed and hardworking volunteers as these!

As an aside, a Longview Daily News story described how Abernathy FTC's PIT tag antenna had been stolen from the mouth of Abernathy Creek. The Lower Columbia FlyFishers read the article and offered funds to help replace the antenna. Although Abernathy FTC did not accept the funds, we are extremely appreciative of the offer. It is a demonstration of the interest and passion local volunteers have for aquatic resources in the Longview area.

Kelli Hawke, with assistance from James Barron, is working on an outreach project along the lines of "Salmon in the classroom" for the Wahkiakum middle school. Kelli contacted Cheri Anderson, Information and Education Manager for the Columbia River Gorge NFH Complex, to get more information about how to do the project.

SCA Interns Margot Cumming and Paul Kieras initiated an effort to update Abernathy FTC's outreach materials and develop new activities for age groups from elementary through high school.

SCA intern Paul Kieras helped Quinault NFH and the Western Washington FWCO with spawning of chum salmon and collection of biodata.

Meetings, Conferences and Trainings

* Patty Crandell took part in Pacific Region FAC Project Leader, Pacific Regional Climate Board, and FTC calls. The FTC calls concentrated on scheduling the annual FTC meeting. It will be held July 10-14 at NCTC.
* Abernathy FTC staff took part in two safety training sessions, and Abernathy FTC's safety committee met and scheduled training for 2017.
* Christian Smith participated in the monthly FWS Conservation Genetics Community of Practice meetings.
* Christian Smith and Jennifer Von Bargen attended the State of California's 2016 Bay-Delta Science Conference in Sacramento, CA to present work done by Abernathy FTC on endangered Sacramento River Winter Run Chinook Salmon.
* Justin Bohling coordinated a conference call between Abernathy FTC, WDFW, and the CRITFC to develop a plan for developing a suite of genetic markers for bull trout using a range-wide dataset.
* Justin Bohling attended a habitat connectivity workshop sponsored by the Lower Columbia Landscape Conservation Design.
* James Barron, Ron Twibell, Ann Gannam and Racheal Headley went to Leavenworth, WA to put on the Fish Nutrition/Fish Health workshop (funded through the FONS process) November 17th. It was well attended by over 20 people from the Winthrop, Entiat, Leavenworth NFHs and Cle Elum and Chief Joseph tribal hatcheries.
* Ron Twibell, John Holmes, Kelli Hawke, James Barron, Ann Gannam and Racheal Headley attended the 67th Annual Northwest Fish Culture Concepts. Ron presented his steatitis work titled: "Effects of dietary lipid source and ultraviolet radiation on growth and fatty acid profile of steelhead, *Oncorhynchus mykiss*"; Ann Gannam presented "Physiological effects of RAS flow regime on steelhead *Oncorhynchus mykiss* and coho *Oncorhynchus kisutch";* James Barron presented a poster titled: "Effects of water flow rate on the culture performance of larval Pacific lamprey (*Entosphenus tridentatus*)".

Ongoing Projects

Water Velocity Effects on Salmon as Reared in Recirculating Systems. *Management Need:* Determine the effects of water velocity on composition, growth, condition, and performance of juvenile PNW salmon as applied to recirculating systems in support of hatcheries in the Pacific Region considering the use of recirculating systems. *Partners:* Pacific Region National Fish Hatcheries, Fishery Resources Program via Fisheries Operations and Need System (FONS).

Diet development for Lost River and short nose suckers in the Klamath River Basin. *Management Need*: Determine dietary needs of listed populations to assist in recovery. *Partners*: Klamath Tribes, Klamath Falls FWO, California/Nevada FHC.

Development of diets and rearing techniques for the culture of Pacific lamprey, *Entosphenus tridentatus*. *Management Need*: Assist Tribal partners in developing methods for the artificial propagation of Pacific lamprey, a species of concern. *Partners*: Yakama Nation; Fishery Resources Program via FONS.

Assessing the effects of multiple tagging methods on Pacific lamprey ammocoetes. *Management Need*: Assist Tribal partners in developing methods for the monitoring and evaluation of this species of concern. *Partners*: Yakama Nation; Fishery Resources Program via FONS.

The physiological response of white sturgeon to handling stress in captivity. *Management Need*: Determine if the stress from catch and release angling is detrimental to survival of white sturgeon, a species of concern. *Partners*: Dalhousie University; Carleton University.

Pacific Region's Fish Feed Quality Control (FFQC) Program. *Management Need*: The FFQC Program, the only one of its kind in the FWS, provides quarterly monitoring of the quality of the commercially produced fish feeds used at Pacific and Pacific Southwest Regions' NFHs. Information is compiled on an annual basis and used in the development of the Pacific Region fish feed contract. *Partners:* Pacific and Pacific Southwest Region's NFHs, Oregon, Washington, Idaho, and Tribal fish hatcheries.

Effects of dietary lipid source and ultraviolet radiation on sunburn and steatitis in Steelhead, *Oncorhynchus mykiss*. *Management Need:* Provide information regarding the potential relationship between fish nutrition and sunburn in steelhead. *Partners*: Pacific Region National Fish Hatcheries

Evaluation of thermal exposure of adult Chinook salmon during the migration to Warm Springs National Fish Hatchery. *Management Need:* Determine if Chinook salmon migrating to Warm Springs National Fish Hatchery experience thermal stress. *Partners*: Warm Springs National Fish Hatchery, Lower Columbia Fish Health Center, Confederated Tribes of Warm Springs.

Natural reproductive success and demographic effects of hatchery-origin steelhead in Abernathy Creek, WA. *Management Need*: Provide information to help managers minimize differences between NOR and HOR fish. *Partners*: Bonneville Power Administration; Washington Department of Fish and Wildlife.

Climate change vulnerability assessments of Pacific Region National Fish Hatcheries. *Management Need:* An understanding of the anticipated habitat changes under different climate change scenarios provides managers with information to proactively respond to these conditions and their impact on NFHs. *Partners*: Pacific Region NFHs; Mid-Columbia River FRO; Fishery Resources Program via FONS.

Fish Suppression of common carp in Malheur Lake using electrofishing to target eggs and embryos. *Management Need*: Determine the feasibility of using electrofishing to kill eggs and embryos for control of invasive common carp in Malheur Lake. *Partner:* Malheur NWR.

Antenna design for the Biomark IS1001 PIT tag reader. *Management Need*: Provide expert level engineering and technical assistance to partners monitoring species of interest using new technologies while reducing biologist time spent in design and troubleshooting. *Partners*: NOAA Fisheries, USFWS Green Bay.

Entrainment and bypass of ESA-listed salmon at irrigation diversions on the Umatilla River. *Management need*: Determine what environmental factors influence the magnitude of fish entrainment into irrigation canals and if captured fish are successfully screened and returned to the Umatilla River using PIT tag technology. *Partner*: Bureau of Reclamation

Aquatic organism passage (AOP) at remediated stream road crossings. *Management Need:* Assess the efficacy of genetic, direct capture, and remote sensing methods to verify fish passage through remediated culverts. *Partners*: US Forest Service, Trout Unlimited.

Mekong River fish ecology and sustainable development. *Management Need*: Assess the scientific capacity and data needs for resource managers in Laos and Cambodia to address hydroelectric development on the main stem Mekong River. *Partners:* USGS, US DOI International Technical Assistance Program (ITAP)

Effectiveness of transitioning to a locally-sourced steelhead broodstock at Winthrop National Fish Hatchery. *Management Need*: Determine if hatchery improvement programs and actions are achieving the expected biological performance objectives. *Partners:* USFWS Mid-Columbia WW and NOAA Fisheries.

Ongoing Projects—continued

Stress response of juvenile steelhead salmon to electrofishing and tagging under different thermal regimes. *Management need:* To understand how fish respond to capture and handling under conditions experienced in late summer. *Partners:* USFWS Directorate Fellows Program.

Evaluation of the spatial and temporal distribution of juvenile Chinook Salmon in the Entiat River. *Management Need:* Use genetic data to improve our understanding of the distribution of spring and summer run Chinook Salmon juveniles and thus improve our ability to prioritize restoration projects targeting spring Chinook Salmon recovery. *Partners:* USFWS Mid-Columbia FWCO

Design and installation of a PIT tag array to monitor outmigration of juvenile Pacific lamprey in the Umatilla River. *Management need:* Determine entrainment rates of juvenile lamprey as they move downstream through the Umatilla River. *Partners:* NOAA-Fisheries, US Bureau of Reclamation

Rapid response genetic analysis of threatened bull trout collected below dams in the Clark Fork River, MT. *Management Need:* Provide data to inform upstream fish passage decisions for listed bull trout. *Partners:* Avista Corporation; Confederated Salish Kootenai Tribes; Idaho Fish and Game; Kalispel Tribe of Indians; Montana Fish Wildlife & Parks; Montana Ecological Services Field Office; Pend Oreille Public Utility District; Pennsylvania Power & Light, MT.

Genetic identification of endangered winter-run Chinook salmon in the Sacramento River, CA. *Management Need:* Rapid response broodstock identificaonfor spawning of listed species. *Partners:* Livingston Stone NFH; Red Bluff FWO; NOAA Fisheries.

Genetic analysis of bull trout in the Lewis River system. *Management Need:* Facilitate passage of bull trout past hydroelectric facilities. *Partners:* Washington FWO, Columbia River FPO, PacifiCorp, US Forest Service, Washington Department of Fish and Wildlife.

Relative reproductive success of hatchery and wild steelhead in the Deschutes River basin. *Management Need:* Develop genetic markers to monitor genetic diversity of listed populations. *Partners:* Oregon Department of Fish and Wildlife, Idaho Department of Fish and Game, Columbia River Intertribal Fish Commission.

Genetic needs assessment for endangered Lost River and short nose suckers of the Klamath River Basin, OR. *Management Need:* Develop genetic markers to monitor genetic diversity of listed populations. *Partners:* Klamath Falls FWO; U.S. Geological Survey.

Genetic profiles of broodstock at Pacific Region National Fish Hatcheries. *Management Need:* Determine impacts of hatchery origin fish (HOR) on naturally occurring fish (NOR) and monitor the effects of aquaculture practices on HOR populations. *Partners:* Pacific Region NFHs; Fishery Resources Program via FONS.

Genetic run assignment of juvenile Chinook salmon from the American River. *Management Need:* Assess accuracy of length-at-date method for distinguishing Spring run (ESA listed) from Fall run (unlisted) Chinook salmon smolts. *Partner:* Pacific Southwest Regional Office.

Bull trout SNP marker discovery using RAD-seq. Management need: Identify a standardized panel of SNP genetic markers that can be applied to population genetics studies across the species' range. Partners: Washington Department of Fish and Wildlife, Columbia River Inter-Tribal Fish Commission.

Evaluating population structure and effective population size of redband trout in the Deschutes River, OR. Management need: Genetic data will help identify management units for redband trout in the Deschutes River basin. Partners: Oregon Department of Fish and Wildlife.

Genetic assessment of bull trout in the Upper Willamette River, OR. Management need: Provides genetic information relevant to assessing the conservation status of the species and fish passage. Partners: Oregon Department of Fish and Wildlife.